

A STUDY ON THE EFFECT OF DIFFERENT TYPES OF BLADES / TINE ON WHEAT PRODUCTION USING RIDING TYPE POWER TILLER

KUMAR SHAILENDRA & SINGH NEELAM KUMAR

*Assistant Professor and HOD, Department of Agricultural Engineering, BNPG College,
Rath, Hamirpur, Uttar Pradesh, India*

ABSTRACT

In the present study, five treatments i. e. C, L, T, combination C+T and combination L+T were experimented to test their effect on wheat crop (Kanchan) yield during the two successive years 2009-2010 and 2010-2011, at IGKV, Raipur Chhattisgarh, India, using R. B. D at the same site. It is found that aforesaid treatments have significant difference among themselves. The combination L+T type tiller gives best results in wheat yield. The average of the treatment effects was compared from the CD and has been found to differ insignificantly. It is advised that in National planning, L+T type combination should be recommended for the small and marginal farmers adopting power tillers for gross country wide increase of wheat production.

KEYWORDS: Level of Significance, Null Hypothesis, Power Tiller, Tilling Practices & R. B. D

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INTRODUCTION

Our Indian society is mostly dependent on farming. Most of the cultivation pattern of India from *Rigveda* period to modern period was dependent on the energy of bullocks. It was integrative part of the farming society to associate with animal husbandry which was a high source of nutrition for the population and energy for farming activity. Day by day after independence, India has been transformed with high farming technological innovation and assimilation. On the other hand, due to high population growth, big farmers have exponentially converted into small and marginal farmers. It was concept of big farmers to use tractors as sources of energy replacing bullocks and he-buffalos power. Ultimately, it resulted to high fuel consumption and environmental pollution. Simultaneously, because of high cost of tractors, small and marginal farmers are hiring tractors for their farming activity, which also peculated into disinterest in bullock energy.

This has created a total vacuum of animal energy and farmers are bound to be dependent on tractors and fuels. In coming future because of constant reserve of fuel in nature, it can create havoc for the whole humanity when there is no fuel in nature. Therefore, it is of immense importance to discover a methodology where big, small and marginal farmers may reduce the consumption of fuel and increase the production. The high cost of tractors is inversely proportional to the number of small or marginal farmers adopting the tractor's technology. To meet out such objectives, a power tillers is an important substitute to optimize the fuel consumption and increase the crop production which is even more economical and assessable to small and marginal farmers.

Edminister and Miller, (1959) observed that the conventional tillage created a satisfactory medium for plant growth, but on the other hand it destroyed the soil structure, increased the compaction and reduced the infiltration

rate and organic matter. They further reported that minimum tillage reduced the soil compaction to conventional tillage whereas the crop yield remained at par in plots under minimum tillage treatments when compared with that of conventional treatments.

Varshney *et al.* (1995) reported for a power tiller operated till plant system developed at NDUA&T, Faizabad for application of granular fertilizer and drilling of seed of wheat, soyabean, Bengal gram sorghum etc. They reported that the field capacity of machine was reported to be 0.2 ha/h for wheat, and the field efficiency was 70 -80%. They further reported that the power requirement was found to be 8 – 10 hp and depth of seed placement was found to be 6.0 – 10 cm.

Kumaraswamy (1991) conducted an experiment during *rabi* season of 1979 -1980 to find the feasibility of zero and reduced tillage systems of wheat cultivation. In case of zero tillage application of weedicide after sowing was also done. He found that plant population was very less in case of zero tillage but there was no difference in reduced and conventional tillage. He further reported that the number of tillers was all most same in all cases, yield was less in case of zero tillage as compared to reduced and conventional tillage but there was difference in yield in reduced and conventional tillage also.

Singh and Panesar (1991) conducted an experiment to find out the optimum combination of tillage tools for seed bed preparation of wheat after rice harvest. They found that grain yield high when chisel plough or rotator cultivator and pulverizing roller used in combination with other equipment. They further reported that the combination of disc harrow, pulverizing roller and a plank was optimum for net energy and economic return.

Power tillers are light in weight. Therefore, their shrinkage is low on soft soils. On the other hand, heavy tractors have a large turning radius, high pressure, on the land due high weight of the tractor and damages seed and crops. The heavy wheels of big tractors compact the soil layers which reduce infiltration rate, damages several microbes and organism.

It is quality of blades/ tine that has multi-dimensional effect on the soil, soil nutrients, microbes, organism and moisture, that has impact on the productivity of the crop. It is pattern of tilling the soil in producing the grain since the *Rigveda* period as can be seen from several *Sukta* in *Mandal I* of *Rigveda*. There was a harmonious combination of ghee, fire and tilling methods used in agriculture as can be seen from several hymns of *the Rigveda* in offerings to the nature in *Yagya (Rigveda Sanhita, 2014)*.

Thus tilling method is first quest of Indian civilization that brought revolution in food production since ancient time. Gradually, we are innovating and adopting different types of tools which can increase our grain production. It is for this investigation that an experiment was conducted to examine different types of tillage tools as treatments to measure their effect on yield of wheel crops as a treatment effect.

Therefore, different type of blades and tractive tine with their combination can give variable of yield of the crop which is measurable. The effect on the yield of a particular crop by different types of rotary blades with tractive tine and their combination is a random variable. Therefore, statistical principles are valid and can be analyzed statistically. In the present study, Design of experiments was used to study the effect of power tiller operated rotary blades and tractive tine with their combinations.

An experiment was carried out during 2009-2010 on the research farm of the Department of Agricultural Engineering, IGKV, Raipur, Chhattisgarh, India. Power tiller is used with existing rotary blades C, L and designed tractive

tine T. The tractive T type tine was designed and devolved to examine the effect of these blades/ tines (C, L and T) and their combinations with their level of passes on yield of wheat crop. The sowing methods were common for all plots with developed seed-cum ferti- till drill machine with furrow openers Tractive tine T which was designed & and developed at Workshop of IGKV, Raipur and fitted with riding type power tiller (S. Kumar, *et. al.*, 2014). There are five treatments as five type of blades i. e. C, L, T, and their combinations of C&T, L&T. their effects are shown in Table 1 along with their ANOVA Table in which three level of passes are treated as number of blocks with three replications in R. B. D. Block one is as single pass, block two as double passes and block three as three passes, respectively. The treatments effect were measured and analyzed as shown in ANOVA Tables (Kumar Shailendra, 2012).

RESULTS

The null hypothesis H₀: There is no significant difference between five types of tilling tools in wheat yield, was tested by ANOVA Table.

Table 1: Wheat (*Kanchan*) Yield (q/ha), under Different Treatments and Level of Passes during Year 2009-10

Treatments	Blocks			Total	Average
	1	2	3		
Rotary –C	18.73	20.47	22.03	61.23	20.41
Rotary –L	19.23	23.77	23.5	66.5	22.16667
Tractive –T	18.93	17.93	22.5	59.36	19.78667
C + T	22.77	24.17	24.69	71.63	23.87667
L + T	22.83	26.5	27.3	76.63	25.54333
Total	102.49	112.84	120.02	335.35	
Average	20.498	22.568	24.004		

Table 2: ANOVA Table

Sources of Variance	DF	SS	MSS	F _{calculated}	F5% _{tabulated}
Replication	2	31.07	15.53	10.15	4.459
Treatments	4	68.69	17.17	11.23	3.838
Error	8	12.24	1.53		
Total	14	112			

CD =2.329

Table 3

Years	Tractive – T	Rotary –C	Rotary –L	C + T	L +T	CD
2009-10	19.78667	20.41	22.16667	23.87667	25.54333	2.329

From the ANOVA table, it evident that F calculated is greater than F tabulated at 5% of level of significance at 4 and 8 degree of freedom in the 2009 -10. Therefore, our null hypothesis that there is no significance difference between treatments is rejected. Thus, the effect of different types of rotary blades/ tine and their combinations have significant difference among themselves in the yield of wheat crop.

Now, after putting the effect on wheat yield by five types of rotary blades / tines as shown below, it is found that L+T type i. e. combination of rotary blades with tractive tine gives the best performance in wheat production. But, T type tine gives lowest performance. The critical difference (CD) indicates that T type tine and rotary blade C have insignificant difference. Similarly, rotary L and C+T do not differ significantly.

Again in the year 2010 -11, the same experiment was conducted at same field using treatments as C, L, T, C+T

AND L+T and their effects as wheat yield was measured and analyzed using RBD as shown below in Table 4 and ANOVA Table. Here also we had H_0 : There is no significant difference between five types of tilling tools in wheat yield.

Table 4: Wheat (*Kanchan*) Yield (q/ha), under Different Treatments and Level of Passes during Year 2010-2011

Treatments	Blocks			Total	Average
	1	2	3		
Rotary –C	19.77	24.00	26.00	69.77	23.257
Rotary –L	19.92	25.50	27.09	72.51	24.170
Tractive –T	19.00	23.50	26.00	68.50	22.833
C + T	22.00	26.99	29.00	77.99	25.997
L + T	21.00	28.00	29.00	78.00	26.000
Total	101.69	127.99	137.09	366.77	
Average	20.34	25.60	27.42		

Table 5: ANOVA Table

Sources of Variance	DF	SS	MSS	F _{calculated}	F5% _{tabulated}
Replication	2	135.2	67.59	211	4.459
Treatments	4	26.73	6.683	20.86	3.838
Error	8	2.562	0.32		
Total	14	164.5			

CD = 1.066

Table 6

Years	Tractive – T	Rotary –C	Rotary –L	C + T	L + T	CD
2010-11	22.833	23.257	24.170	25.997	26.00	1.066

We can see that, $F_{\text{calculated}} > F_{\text{tabulated}}$ at 5% level of significance at 4,8 DF. Therefore, we reject the hypothesis and conclude that effects of 5 type of tilling tools/ combinations differ significantly among themselves. Putting their effects in ascending order and comparing with their CD, we can compare the significant difference between two treatments. Here also we find that L+T type combination gives the maximum yield of wheat.

CONCLUSIONS

From the above experiments, the research findings states that power tillers with combinations Land T give best results in wheat yields which can be advised and recommended to the farmers for best profit. It is also seen that the difference between rotary L and L+ T is greater than CD. Hence, rotary L and L+T are identified as two distinct tillers having different effect on yield of wheat. In national planning, at gross level, the farmers having small and marginal land holdings, adopting the L +T type combination of rotary blade and tine can accelerate the wheat yield. Therefore, the same should be advised, recommended for subsidy and be extended at gross root level among small and marginal farmers.

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